# FOOD OF THE BLACK BULLHEAD *(Ictalurus melas)* IN A NEW RESERVOIR

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## ABSTRACT

Stomach contents of black bullheads (*Ictalurus melas*) collected from inshore areas of newly impounded Beaver Reservoir by electroshocker revealed distinct differences in diet between periods of relatively stable water levels and rapidly rising water level. During stable water level periods, Entomostraca formed 72 percent of the volume of food of young-of-the-year bullheads (<4 inches, total length). Filamentous algae, organic detritus and crayfish made up 94 percent of the food volume found in 4.0-11.3-inch bullheads collected during these periods.

Contrastingly, during winter-spring months when water level rose and inundated basin soils for the first time, bullheads over four inches ate predominantly terrestrial animals (56% by volume). Earthworms comprised 28 percent of the total volume, followed by a wide representation of insects (15 percent), particularly grubs and caterpillars. Slugs, spiders, centipedes, millipedes, pill bugs and a worm snake were recorded. Filamentous algae remained an appreciable (26 percent) component of the food consumed.

Black bullheads (four to eight inches in length) were collected in offshore areas at night by midwater trawl during the summer. Stomach contents were comprised almost entirely (98 percent) of the phantom midge, *Chaoborus*.

## INTRODUCTION

In attempting to identify causes of the fluctuations in sport fish populations and harvest in large reservoirs, data on food habits of the principal fishes from a new and an older impoundment of the White River, Arkansas and Missouri, are being sought by biologists of the South Central Reservoir Investigations. Preliminary descriptions of the limnology and foods eaten by young largemouth bass of these two reservoirs have been reported (Mullan and Applegate, in press); (Applegate and Mullan, in press). Observations presented herein pertain to the foods of the black bullhead (*Ictalurus melas*) collected from Beaver Reservoir during the second and third years of filling. The black bullhead did not represent a dominant species in older Bull Shoals Reservoir, filled in 1952. Only three specimens were collected in 55 nocturnal electrofishing samplings in the years 1963-65.

## DESCRIPTION AND METHODS

Beaver Reservoir began filling in 1963, reaching 6,400 surface acres in 1964, 16,200 acres in 1965, and 26,400 acres (94 percent of ultimate area and 91 percent of volume) in May 1966. Inundation of the forest, brush and pasture land basin occurred from January through June each year.

Fish were collected inshore during daylight hours with a 220 volt A.C., boat-mounted electroshocker. Collections were made biweekly between May 1965 and July 1966 and subsamples taken from total collections. Stomach contents of up to 20-25 fish were pooled within size groups of 0-1.9, 2.0-3.9, 4.0-7.9, and 8.0 plus inches total length, but later recombined to represent fish less than or greater than 4.0 inches of length, when no appreciable differences were found between the smaller size groups. Volumetric measures were made by water displacement and numerical determinations with a Sedgwick-Rafter counting cell.

## RESULTS

Entomostraca formed 72 percent, filamentous algae 16 percent, aquatic insects six percent, organic detritus three percent, and terrestrial organisms three percent of the volume of foods found in 213 black bull-

heads under 4.0 inches in length (Table 1). Of the entomostracans eaten, cladocerans constituted 52 percent of the total. Species were primarily representative of benthos or littoral forms, namely, *Leydigia quadrangularis, Pleuroxus hamulatus, P. denticulatus, Bosmina longirostris, Chydorus sphaericus, Camptocercus rectirostris, Kurzia latissima*, and *Sida crystallina*. Ostracods were next in order of significance regularly ingested, representing 18 percent of the total fare.

TABLE 1. Percent of total volume of foods eaten by black bullheads collected from Beaver Reservoir, 1965-1966.

| Length group (inches) | 0.8-3.9 | 4.0-11.3 | 4.0-11.4 | 4.0-7.9 |
|---|---|---|---|---|
| Collection method | electro-fishing | electro-fishing | electro-fishing | mid-water trawl |
| Water level | rising, stable, falling | stable or falling | rising | stable |
| Number examined | 213 | 74 | 130 | 44 |
| Number with food | 203 | 58 | 95 | 43 |
| Volume (cc.) | 4.1 | 53.9 | 232.9 | 15.1 |
| Fish | | 0.4 | 1.0 | |
| Fish eggs | | | 0.3 | |
| Terrestrial | 2.5 | 1.3 | 55.5 | |
| Oligochaets | 2.5 | | 28.2 | |
| Insects | trace | 1.3 | 14.9 | |
| Molluscs (slugs) | | | 5.1 | |
| Arachnoids (spiders) | | | 2.5 | |
| Centipedes | | | 0.4 | |
| Snakes (worm) | | | 2.2 | |
| Millipedes | | | 1.8 | |
| Pill bugs | | | 0.4 | |
| Aquatic insects | 6.5 | 1.9 | 5.4 | 98.0 |
| Ephemeroptera | 1.6 | 0.2 | 0.1 | |
| Odonata | | | 0.3 | |
| Tendipedidae | 4.1 | 1.6 | 4.8 | 0.1 |
| Ceratopogonidae | 0.4 | 0.2 | 0.1 | |
| Unidentified Diptera | 0.1 | | | |
| Chaoborus | 0.2 | | 0.1 | 97.9 |
| Trichoptera | 0.1 | | | |
| Water mites | 0.2 | | | |
| Crayfish | | 26.0 | | |
| Entomostraca | 72.0 | 1.4 | 0.3 | |
| Cladocera | 51.8 | 1.4 | 0.2 | |
| Copepoda | 2.6 | | | |
| Ostracoda | 17.6 | trace | 0.1 | |
| Mollusca (snails) | | | trace | |
| Nemata (horsehair worms) | | | 0.8 | |
| Filamentous algae | 15.8 | 35.8 | 25.7 | 1.3 |
| Organic detritus | 3.0 | 32.3 | 9.7 | 0.7 |
| Inorganic detritus | | 0.8 | 1.3 | |

Bullheads under four inches were young-of-the-year, ranging down to 0.8 inches (20 mm.) in length, and were primarily collected in June and July of 1965 and 1966 (Figure 1). There was no indication of a change in food with increasing size within this group nor appreciable variation in the foods eaten between years.

Striking seasonal differences were revealed by the stomach contents of black bullheads 4.0 inches or larger. Of 74 examined for the periods July through December 1965 and the following June-July, when

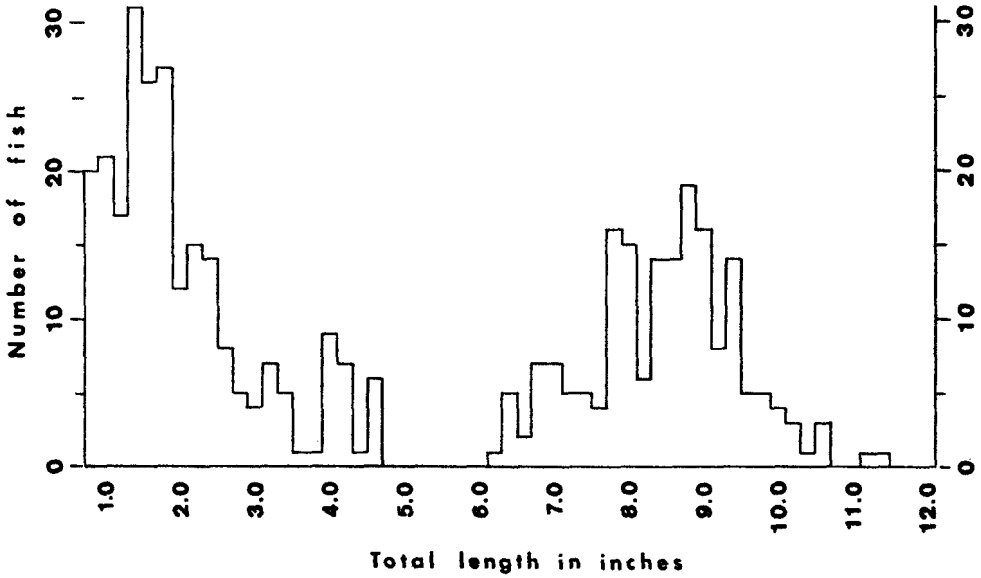


Figure 1. Length-frequency histogram of black bullheads examined for foods eaten collected from Beaver Reservoir with an electroshocker, May 1965-July 1966.

reservoir water levels were relatively stable or falling slightly, filamentous algae, organic detritus, and crayfish formed 94 percent of the volume of food (Table 1). Contrastingly, 130 similar-sized fish collected during the winter-spring months (May-June 1965 and December-May 1966), when water levels were rising, predominantly ingested terrestrial foods (Table 1, Figure 2). Included were earthworms, comprising 28 percent of the total, followed by a wide representation of insects (15 percent), particularly grubs and caterpillars, with slugs, spiders, centipedes, millipedes, pill bugs and one worm snake making up the remainder. In spite of the wide variety of desirable animal foods apparently available, filamentous algae remained an appreciable component (26 percent) of the total food. Interestingly, horsehair worms were regularly eaten during this period, although a minor item.

Adding another dimension to the selectivity of foods eaten were two mid-water trawl samples collected July 27 and August 27, 1965, representing 44 black bullheads inhabiting offshore waters at night. These fish were found to have fed almost exclusively (98 percent) on *Chaoborus* larvae (Table 1).

## DISCUSSION

The significant utilization of entomostracans by Beaver Reservoir black bullheads throughout the first summer of life parallels the findings of Forney (1955) in Clear Lake, Iowa. The mean daily growth rates of 0.59 mm. and 0.63 mm. in Beaver Reservoir, June 9-August 10, 1965, and June 17-July 18, 1966, respectively, also parallel the 0.54 mm. and 0.98 mm. values reported for Clear Lake July 1-August 20, 1951-52.

Beyond four inches in length, the similarity of Beaver Reservoir bullhead stomach contents with those reported from other waters ends. Food habit studies by Ewers and Boesel (1935), Forney (1955), Kutkuhn (1955), and Welker (1962) portray a transition to Tendipedidae larvae above this size and subsequently to a reliance on fish as food. Seaburg and Moyle (1964) depict Mollusca as contributing substantially to the food of 8.1-8.8-inch black bullheads examined. Beaver Reservoir bullheads ate none of these foods in major quantities, even though

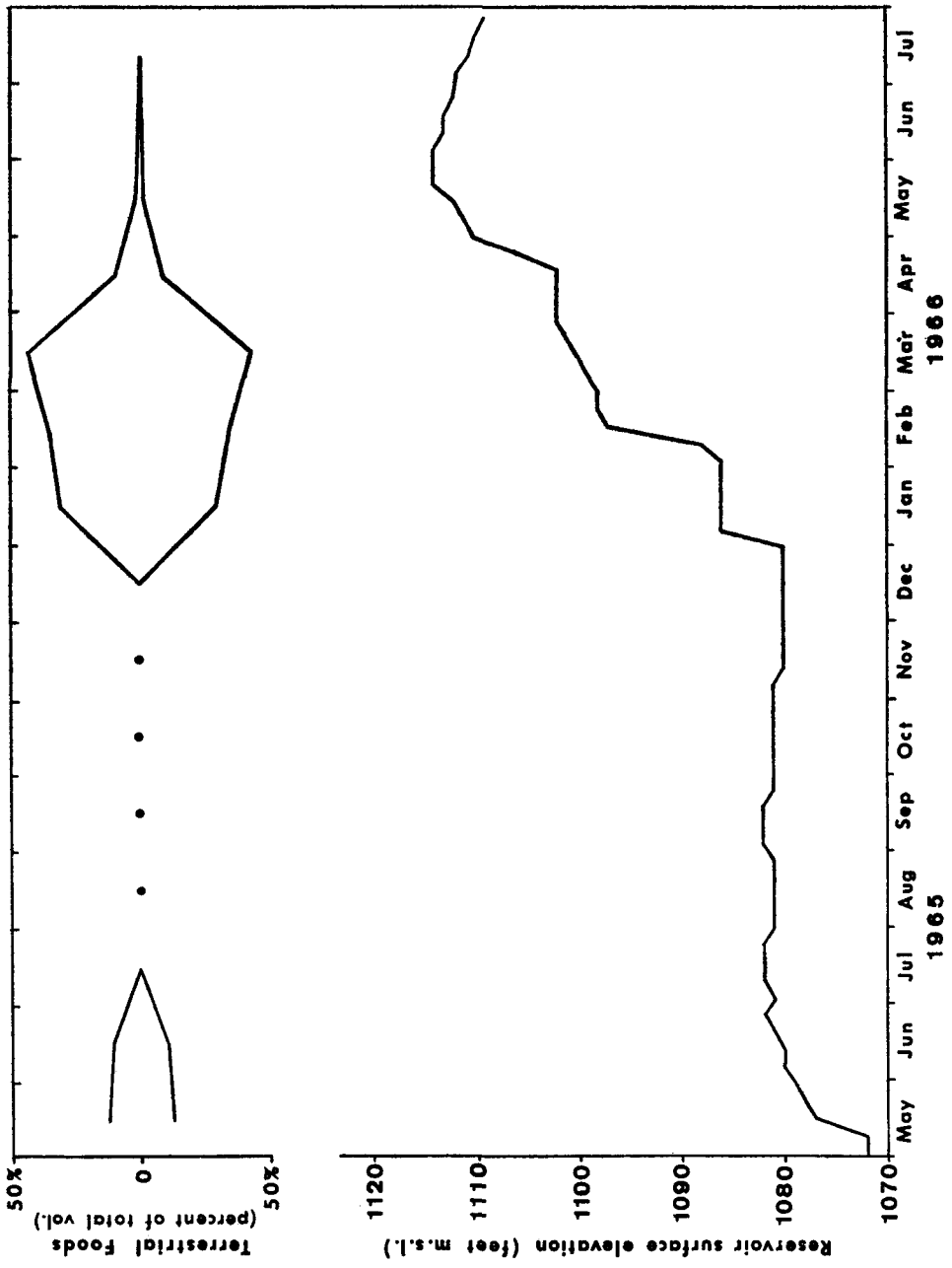


Figure 2. The percent by volume of terrestrial organisms in the diet of 4+ inch black bullheads captured inshore and the water storage elevations of Beaver Reservoir, May 1965 through July 1966.

Tendipedidae were extremely abundant in the reservoir. The only significant food items recorded in other studies which also occurred in Beaver Reservoir bullheads were filamentous algae and organic detritus.

These data obviously indicate a substantial terrestrial fauna contribution to the bullhead forage base in Beaver Reservoir during the first three years of filling. The terrestrial food contribution is further emphasized by the large amounts of organic detritus (predominantly annual plants) ingested.

However, aquatic forage organisms available to the bullheads were also important. Intermediate size bullheads (4.5-6.5 inches) were inadequately sampled in electrofishing (Figure 1), suggesting they did not inhabit shockable inshore areas during this stage of growth. Virtually all the specimens taken in the July-August mid-water trawl samples were of this size. Their 98 percent *Chaoborus* diet probably reflects a spatial response to the abundance of this nocturnal migrating phantom midge, just as the winter-spring samples featuring terrestrial items represented a reaction to high food availability inshore. Mean townet numbers of *Chaoborus* per cubic meter in the reservoir during their planktonic stage in June, July, August, and September 1965 were 107, 216, 257, and 91, respectively, with the peak representing an estimated standing crop of 15 million per acre. Any such huge potential food source must be carefully considered in weighing the relative importance of the terrestrial versus aquatic contribution.

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# PRELIMINARY OBSERVATIONS ON SUPPLEMENTARY FEEDING OF POND FISHES


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1966

## ABSTRACT


The food cycle of bluegill and redbreast sunfish was short circuited by direct feeding of dry pellets in an attempt to increase the produc-